

REMARKS

Claims 1-11 were examined. Claim 1 and 7 are amended. Claims 12-15 are canceled. Claims 1-11 remain in the Application.

The Patent Office rejects claims 1-4 and 7-8 under 35 U.S.C. § 102(e). The Patent Office finds claims 5-6 and 9-11 allowable over the prior art of record.

A. 35 U.S.C. § 102(e): Rejection of Claims 1-4 & 7-8

The Patent Office rejects claims 1-4 and 7-8 under 35 U.S.C. § 102(e) as anticipated by U.S. Patent No. 6,806,192 of Lin et al. (Lin). Among other processing operations, Lin discloses forming metal barrier 18 over inside surfaces of opening 25 and over the surface of the patterned and etched layers of dielectric. See col. 4, lines 13-16. Next, metal barrier 18 is oxidized, creating an oxidized surface highlighted as layer 19 over the surface of layer 18. It is noted that layer 19 is formed in opening 25 and over the surface of the dielectric.

Independent claim 1 is not anticipated by Lin, because Lin does not disclose forming a barrier layer on a substrate surface including in at least one contact opening and a field region relative to the contact opening; forming an interconnect in the contact opening; and reducing the electrical conductivity of the barrier layer in the field region selective of the barrier layer in the at least one contact opening. As noted in the Application at page 9, paragraphs [0030] and [0031], in one embodiment, the method teaches a reduction or minimization of electrical conductivity of a material for barrier layer 150 in the field region. It is noted that a contact opening includes interconnect material and therefore may block any reduction or minimization of the electrical conductivity of a material for barrier layer 150 in the contact opening. Lin, on the other hand, oxidizes metal barrier 18 to form layer 19 when metal barrier 18 is exposed on the surface and in opening 25. Thus, Lin does not selectively reduce the electrical conductivity of the barrier layer over the surface of the dielectric relative to opening 25.

Claims 2-4 depend from claim 1 and therefore contain all the limitations of that claim. For at least the reason stated with respect to claim 1, claims 2-4 are not anticipated by Lin.

Independent claim 7 is not anticipated by Lin, because Lin does not disclose forming a barrier layer on a substrate surface; depositing a conductive material on a contact opening; removing the conductive material sufficient to expose the barrier layer on the substrate surface; and after removing the conductive material, reducing the electrical conductivity of the barrier layer. As noted above, Lin oxidizes metal barrier 18 following its deposition, and prior to a deposition of subsequent layers.

Claim 8 depends from claim 7 and therefore contains all the limitations of that claim. For at least the reason stated with respect to claim 7, claim 8 is not anticipated by Lin.

Applicants respectfully request that the Patent Office withdraw the rejection to claims 1-4 and 7-8 under 35 U.S.C. § 102(e). Applicants note that the Patent Office also cites U.S. Patent No. 6,524,867 of Yang et al. (Yang) in connection with the rejection under 35 U.S.C. 102(e). Yang is apparently cited for the proposition that oxidation of a metal barrier will inherently reduce the electrical conductivity of the barrier layer. Because Applicants note processing operations in the claimed method that are distinguishable from Lin, the inherency proposition raised by the Patent Office is moot.

B. Allowable Subject Matter: Claims 5-6 & 9-11

The Patent Office objects to claims 5-6 and 9-11 as dependent upon rejected base claims. The Patent Office finds these claims allowable over the prior art of record if rewritten in independent form. Given the arguments presented above, Applicants believe that it is unnecessary to amend claims 5-6 and 9-11 as suggested by the Examiner. Applicants respectfully request that the Patent Office withdraw the rejection to claims 5-6 and 9-11.

CONCLUSION

In view of the foregoing, it is believed that all claims now pending patentably define the subject invention over the prior art of record and are in condition for allowance, and such action is earnestly solicited at the earliest possible date.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2666 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17, particularly, extension of time fees.

Respectfully submitted,

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I hereby certify that this correspondence is being transmitted by facsimile on the date shown below to the United States Patent and Trademark Office.

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8/16/05
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